

Comparison of purchasing power parity between the United States and Canada

Purchasing power parities determine expenditures for real gross domestic product among countries without the use of the exchange rate to convert currencies; parities more accurately reflect the rate at which currency in one country can be converted to buy an equivalent "market basket" in another country

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In August 1987, the Organization for Economic Cooperation and Development (OECD) published results from the 1985 study of multilateral purchasing power parity for its member countries. A purpose of the study was to compare various types of economic data among countries without using market exchange rates to convert the data to a common currency. Because exchange rates do not necessarily reflect the relative purchasing powers of different currencies within countries, the use of exchange rates as a converter for international comparisons could show relationships in price and output levels that did not actually exist. Consequently, a system of purchasing power parities was developed to more accurately reflect the rate at which one currency could be converted to another to purchase equivalent goods and services in both countries. This system not only makes it possible to compare real levels of gross domestic product between countries, rather than nominal levels (which would be obtained if the data were converted using exchange

rates), but can also be used to compare real levels of personal and government consumption and gross fixed capital formation, as well as smaller expenditures such as for food, housing, and construction.

The effort to develop a method for comparing real gross domestic product and national accounts aggregates among countries began in the 1950's with studies conducted at the Organization of the European Economic Community (predecessor to OECD) by Irving Kravis and Milton Gilbert. These studies provided the basic approach and the methodology that was then further refined in benchmark studies in 1970, 1973, 1975, and 1980 under the auspices of the United Nations Statistical Agencies, the University of Pennsylvania, the Statistical Office of the European Communities (EUROSTAT), and the OECD. The strategy of these earlier studies (phase I through IV) was to create a system of world-level comparisons by conducting a series of regional comparisons under the auspices of the United Nations regional economic commissions.

The results of the 1985 OECD regional study, while an independent exercise with the European Community study embedded in it, will be incorporated into the world-level project of the United Nations Statistical Office (phase V of the international comparison project). The various regions in the international comparison project will be subsequently linked together by countries either participating in two regions, such as Japan (OECD and ESCAP). Austria (European

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Communities and Group II), or Finland (OECD and Europe Group II), or by carrying out bilateral "core-comparisons" between countries in different regions.

The decision to calculate bilateral purchasing power parities between Canada and the United States was made in 1985, shortly after the OECD Secretariat started work with U.S. and Canadian governments on data collection for the multilateral OECD purchasing power parity project. It was felt that it would be useful to carry out a special data collection exercise that would tighten the links between the two North American countries, and to calculate a special binary comparison which would exclude all data for third countries and would permit a degree of disaggregation of expenditure categories unconstrained by the classification necessarily adopted by the multilateral project.

This article presents estimates of purchasing power parity and real gross domestic product between the United States and Canada. It explains what purchasing power parities are and how they are calculated, and discusses the methodology and operational procedures underlying the data.

What are purchasing power parities?

As purchasing power parities (PPP's) are nothing more than interspatial price indexes (by analogy with the intertemporal price indexes such as consumer price indexes), the methodology and theory underlying their calculation are identical to those of more familiar index numbers. Just as consumer price indexes can be used to compare purchasing power in the same place at different times, PPP's compare purchasing power in different places at the same time.

In many countries, consumer price indexes are calculated by measuring the cost of a fixed basket of typical consumer goods and services at different times, weighting the various prices using weights intended to convey the average expenditure pattern of consumers. It is possible to consider price indexes as PPP's in the same country but between one period and the next—the consumer basket which cost \$1 at time 0 costs \$1.10 at time 1, and so forth. Conversely, PPP's could be considered consumer price indexes between countries at the same point in time—for example, the consumer basket which costs \$1 in U.S. dollars in the United States costs \$1.25 in Canadian dollars in Canada.

There are some differences of emphasis, however, between intertemporal and interspatial price indexes. An important difference is the choice of the goods and services making up the basket. In the intertemporal case, the goods and services chosen are characteristic and representative of expenditure categories in the country concerned. Only after a lengthy period does an item in the basket become unavailable or obsolete. It is more difficult to choose a basket of goods and services equally representative and characteristic in two or more countries. Even in neighboring countries with a similar level of economic development, one may encounter different preferences for a variety of reasons (tastes, climate, size and type of packaging, and so forth).

Also, although PPP's covering private consumption expenditure can be calculated consistently with consumer price index theory, the usual coverage of PPP's is that of the goods and services which make up gross domestic product. Thus, the PPP "basket" must include a selection of consumer goods and services, plant and machinery investment goods, construction activities, and collectively consumed services such as public administration, education, and health (the PPP's of the latter three are usually calculated by comparing the prices of their inputs).

To sum up, to calculate PPP's we need (1) a list of consumer goods and services, plant and equipment investment goods, construction activities, and collectively consumed nonmarket services—"the basket"; (2) the expenditure patterns in the countries concerned which can be used as weights to aggregate the price information (this information is usually obtained from national accounts suitably supplemented by data from expenditure surveys of consumption or investment); and (3) the estimated average annual national prices of the various goods and services in the basket.

Of course, the list is not an exhaustive list of the goods and services consumed in the countries concerned, and certainly estimates of total national expenditures are available only for more or less precisely defined categories. Furthermore, for a product to be included in the list, it must be available in at least two of the countries concerned. In addition, the list must be representative of the expenditure category (basic heading) and characteristic of at least one country. Price ratios for products falling into the same expenditure category are averaged by calculating the unweighted (geometric) mean. Above that level, expenditure weights are used to calculate weighted (geometric) means.

In the early stages of this PPP project, two types of index number formulas were selected as appropriate for this application, the equiweighted Fisher and the Tornqvist. Consequently, most of the tables in this article contain the results for both formulas. However, as a matter of convenience, the Bureau of Labor Statistics and Statistics Canada decided to focus on the Fisher index because in this particular bilateral comparison, the choice between formulas is not of great numerical significance.

U.S.-Canadian parity

The PPP from the 1985 benchmark bilateral comparison for gross domestic product, the central result of the study, is estimated at 1.255 Canadian dollars per U.S. dollar. This figure agrees closely with the 1.22 estimate from the Canadian-U.S. gross domestic product result of the multilateral study released by the OECD and EUROSTAT in August 1987, and compares with the average exchange rate estimate in 1985 of 1.366 Canadian dollars per U.S. dollar.

The parity for individual final consumption of 1.266 Canadian dollars per U.S. dollar, although numerically very close to that for gross domestic product, is the aggregate of some significantly different results for subcategories. (See

Table 1. Purchasing power parities in 1985, selected expenditures of Canada relative to the United States

EUROSTAT code	Item	Fisher index	Tornqvist index	EUROSTAT code	Item	Fisher index	Tornqvist index
1111	Food	1.367	1.368	119	Net purchases abroad	1.259	1.258
1112	Nonalcoholic beverages	1.098	1.098				
1113	Alcoholic beverages	1.502	1.501	11	Individual final consumption	1.266	1.263
1114	Tobacco	1.834	1.832				
111	Food, beverages, and tobacco	1.416	1.417	1311	General government compensation	1.259	1.259
1121	Clothing, including repairs	1.349	1.347	1312	General government intermediate	1.410	1.412
1122	Footwear, including repairs	1.480	1.481	1313	General government depreciation	1.163	1.162
112	Clothing and footwear	1.368	1.366	131	General public services	1.315	1.315
1131	Gross rent and water charges	1.324	1.325	1321	Education services compensation	1.333	1.333
1132	Fuel and power	1.064	1.066	1322	Education services intermediate	1.386	1.387
113	Gross rent, fuel, and power	1.270	1.271	1323	Education services depreciation	1.163	1.162
				132	Education	1.325	1.325
1141	Furniture, floor coverings, and repairs	1.516	1.517				
1142	Household textiles and repairs	1.379	1.377	13	General government final consumption	1.318	1.318
1143	Major household appliances and repairs	1.386	1.386				
1144	Glass and tableware, utensils, and repairs	1.132	1.131	1411	Other plant and equipment	1.345	1.345
1145	Household operation	1.462	1.473	1412	Electrical and telecommunication equipment	1.260	1.260
1146	Domestic services	1.739	1.739	1413	Transport equipment	1.255	1.255
114	Household equipment and operation	1.426	1.427	141	Plant and equipment	1.310	1.310
1151	Medical and pharmaceutical products	1.277	1.277	1421	Dwellings	1.169	1.169
1152	Therapeutic appliances and equipment	1.085	1.085	1422	Nonresidential buildings	1.069	1.069
1153	Medical services outside hospitals .....	.548	.548	1423	Civil engineering works .....	.984	.986
1154	Hospital care	1.295	1.294	142	Construction and civil engineering	1.078	1.077
115	Medical care and health expenses .....	.959	.961				
1161	Personal transport equipment	1.243	1.243	14	Gross fixed capital formation	1.163	1.163
1162	Operation of transport equipment	1.310	1.307				
1163	Purchased transport	1.251	1.263	15	Change in stocks	1.270	1.270
1164	Communications	1.224	1.223	16	Net exports of goods and services	1.366	1.366
116	Transport and communication	1.270	1.269				
1171	Equipment and accessories	1.184	1.184	1	Gross domestic product	1.255	1.253
1172	Entertainment, recreation, and culture	1.077	1.078	2	Consumer services	1.180	1.177
1173	Books, magazines, newspapers	1.175	1.178	3	Consumer goods	1.337	1.337
1174	Education	1.148	1.149				
117	Education, recreation, and culture	1.148	1.149	4	Total services	1.216	1.215
1181	Personal care and effects	1.085	1.085	5	Total goods	1.270	1.270
1182	Goods, not elsewhere classified	1.853	1.853				
1183	Expenditure in restaurants and hotels	1.281	1.281	6	Tradable goods	1.332	1.333
1185	Financial services, not elsewhere classified	1.204	1.219				
1186	Other services, not elsewhere classified	1.281	1.289	7	Gross final consumption expenditure	1.263	1.275
118	Miscellaneous goods and services	1.281	1.289	8	Gross final expenditure	1.243	1.253

NOTE: Indexes are based on Canadian dollars per U.S. dollar.

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

table 1.) Individual final consumption for food, beverages, and tobacco (1.416 Canadian dollars per U.S. dollar), clothing and footwear (1.368), and household equipment and operation (1.426) are relatively expensive in Canada, with the PPP for these categories exceeding the exchange rate in 1985.

In contrast, the lowest PPP for a major category in individual final consumption was for medical care and health expenses, (0.959 Canadian dollars per U.S. dollar). The major influence holding this category down was medical care outside hospitals which, in Canada, is offered under provincially administered medicare plans. Within individual final consumption, it is possible to break down food consumption and expenditures in restaurants and hotels. (See table 2.) The PPP in food ranged from 1.585 Canadian dollars per U.S. dollar for milk, cheese, and eggs to 0.949 for raw and refined sugar. In addition, alcoholic beverages and tobacco, with PPP's of 1.502 and 1.834 are substantially more expensive in Canada, while nonalcoholic beverages (1.098) are cheaper. In the area of expenditures for food in restaurants and hotels, both subcategories—restaurants and cafes and hotels—are somewhat less expensive in Canada.

The parity for government final consumption was 1.318 Canadian dollars per U.S. dollar. This figure is dominated by expenditures for employee compensation and is subject to the statistical margins of error associated with measuring national average compensation and the difficulties of comparing compensation under different administrative systems.

A striking feature of the overall results is the way the gross fixed capital formation figure of 1.163 Canadian dollars per U.S. dollar is composed of the contribution of plant and equipment (relatively expensive in Canada at 1.310, although still marginally below the currency exchange rate) and of construction and civil engineering (relatively cheap at 1.078).

The detailed results for the PPP calculations in this article are given at the greatest level of disaggregation of the OECD expenditure classification used for the international comparison project—namely the four-digit level—which seems to be generally supported by the data.

Expenditure patterns. Comparing the national expenditures of Canada, converted at both PPP's and the exchange rate, with those of the United States shows that although the

gross domestic product of Canada was 9.5 percent that of the United States in 1985 in terms of the real volume (converted using PPP's) of goods and services produced, it was 8.8 percent in nominal terms (converted using the exchange rate) because of the relative strength of the U.S. dollar compared with the Canadian dollar. The following tabulation shows national expenditures of Canada relative to the United States in 1985 (U.S. = 100):

	Nominal	Real
Individual final consumption	7.6	8.2
Government final consumption	9.8	10.2
Gross fixed capital formation	9.2	10.8
Gross domestic product	8.8	9.5

The greatest difference occurs for fixed investment where, in terms of volume, Canada is significantly higher than it first appears when national accounts data were converted using exchange rates.

If the subaggregates of gross domestic product expressed as percentages of total gross domestic product are compared, the data show that in real terms Canadians and Americans spent the same percentage on food, beverages, and tobacco, although at exchange rates the Canadian percentage appears higher. (See table 4.) Canadians spent a smaller percentage of their gross domestic product per capita on medical care than did Americans, but spent about the same as Americans did on household equipment and operation and rent, fuel, and power. As noted earlier, the Canadian proportion of gross domestic product spent on fixed investment is stronger than it first appears, and this is due entirely to expenditures for construction and civil engineering.

Gross domestic product. The expenditure given the greatest attention is usually gross domestic product per capita, which is used as an indicator of the standard of living. In this case, Canada's gross domestic product per capita converted into U.S. dollars at exchange rates was \$13,630 in 1985, or 82.6 percent of the U.S. expenditure of \$16,494. (See table 4.) However, converted at PPP's, the Canadian figure rises to \$14,835, which is 89.9 percent of the U.S. expenditure.

Among the components of gross domestic product, real Canadian expenditure per capita in 1985 almost equals that of the United States in government final consumption (exceeds the United States in the education category, and is close in general public services), and is greater in fixed investment. In fixed investments, the notable feature is that the level of construction and civil engineering in Canada is great enough to outweigh the significant lead of the United States in plant and equipment investment. A considerable effort was made by the OECD, United States, and Canadian experts to obtain an accurate comparison of construction prices, a difficult area to price, and to support the basic data for this category.

Canada is, however, more than 20 percent below the United States in individual final consumption on a per capita basis, and is below in all consumption categories.

Data have been calculated for the aggregate consumption (gross final consumption expenditure) and compared with gross fixed capital formation to illustrate the consumption/investment balance in real terms in 1985:

	Gross final consumption expenditure	Gross fixed capital formation	Gross domestic product
U.S. real dollars:			
United States	\$13,820	\$3,074	\$16,494
Canada	11,369	3,127	14,835

Percentage of U.S. gross domestic product:

United States ..	83.8	18.6	100
Canada	68.9	19.0	89.9

Percentage of national gross domestic product:

United States ..	83.8	18.6	100
Canada	76.6	21.1	100

The gross final consumption expenditure and gross fixed capital formation data do not add to 100 percent of national gross domestic product because of the two missing items: the stock change (0.6 percent of gross domestic product in both countries) and the balance of net exports (-3 percent in the United States, and 2.6 percent in Canada).

When revaluing nominal expenditures at PPP's, one is constrained by the breakdown of expenditures provided by national accounts offices. Hence, the data in this article concerning the revaluation of Canadian expenditures in U.S. dollars and U.S. expenditures in Canadian dollars

Table 2. Purchasing power parities in 1985, selected food expenditures of Canada relative to the United States

EUROSTAT code	Item	Fisher index	Tornqvist index
111101	Bread and cereals	1.347	1.348
111102	Meat	1.417	1.418
111103	Fish	1.300	1.306
111104	Milk, cheese, eggs	1.585	1.585
111105	Oils and fats	1.040	1.035
111106	Fruit and vegetables	1.247	1.247
111107	Potatoes and other tubers	1.099	1.099
111108	Raw and refined sugar .....	.949	.949
111109	Coffee, tea, cocoa	1.348	1.351
111110	Other foods	1.429	1.431
1111	Food	1.367	1.368
1112	Nonalcoholic beverages	1.098	1.098
1113	Alcoholic beverages	1.502	1.501
1114	Tobacco	1.834	1.832
111	Food, beverages, and tobacco	1.416	1.417
118301	Restaurants and cafes	1.285	1.287
118302	Hotels and other lodging services	1.243	1.243
1183	Expenditure in restaurants and hotels	1.281	1.281

NOTE: Indexes are based on Canadian dollars per U.S. dollar.

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

Table 3. Canadian price indexes, selected expenditures, 1985

[United States index = 100]

EUROSTAT code	Item	Fisher index	Tornqvist index	EUROSTAT code	Item	Fisher index	Tornqvist index
1111	Food	100.1	100.1	1186	Other services, not elsewhere classified	93.8	94.4
1112	Nonalcoholic beverages	80.4	80.4	118	Miscellaneous goods and services	93.8	94.4
1113	Alcoholic beverages	110.0	109.9	119	Net purchases abroad	92.1	92.1
1114	Tobacco	134.2	134.1				
111	Food, beverages, and tobacco	103.6	103.7	11	Individual final consumption	92.7	92.5
1121	Clothing, including repairs	98.7	98.6	1311	General government compensation	92.1	92.1
1122	Footwear, including repairs	108.3	108.4	1312	General government intermediate	103.3	103.4
112	Clothing and footwear	100.1	100.0	1313	General government depreciation	85.1	85.1
				131	General public services	96.3	96.3
1131	Gross rent and water charges	96.9	97.0				
1132	Fuel and power	77.9	78.0	1321	Education services compensation	97.6	97.6
113	Gross rent, fuel, and power	93.0	93.0	1322	Education services intermediate	101.5	101.6
				1323	Education services depreciation	85.1	85.1
1141	Furniture, floor coverings, and repairs	111.0	111.1	132	Education	97.0	97.0
1142	Household textiles and repairs	101.0	100.8				
1143	Major household appliances and repairs	101.5	101.5	13	General government final consumption	96.5	96.5
1144	Glass and tableware, utensils, and repairs	82.9	82.8				
1145	Household operation	107.0	107.8	1411	Other plant and equipment	98.4	98.4
1146	Domestic services	127.3	127.3	1412	Electrical and telecommunication equipment	92.3	92.3
114	Household equipment and operation	104.4	104.4	1413	Transport equipment	91.9	91.9
1151	Medical and pharmaceutical products	93.5	93.5	141	Plant and equipment	95.9	95.9
1152	Therapeutic appliances and equipment	79.4	79.4				
1153	Medical services outside hospitals	40.1	40.1	1421	Dwellings	85.6	85.6
1154	Hospital care	94.8	94.7	1422	Nonresidential buildings	78.2	78.2
115	Medical care and health expenses	70.2	70.3	1423	Civil engineering works	72.0	72.2
				142	Construction and civil engineering	78.9	78.8
1161	Personal transport equipment	91.0	91.0				
1162	Operation of transport equipment	95.9	95.7	14	Gross fixed capital formation	85.2	85.1
1163	Purchased transport	91.6	92.4	15	Change in stocks	93.0	93.0
1164	Communications	89.6	89.5	16	Net exports of goods and services	100.0	100.0
1171	Equipment and accessories	86.7	86.7				
1172	Entertainment, recreation, and culture	78.8	78.9	1	Gross domestic product	91.9	91.7
1173	Books, magazines, newspapers	86.0	86.3				
1174	Education	84.1	84.1	2	Consumer services	86.4	86.2
117	Education, recreation, and culture	84.1	84.1	3	Consumer goods	97.9	97.9
1181	Personal care and effects	79.4	79.4	4	Total services	89.0	89.0
1182	Goods, not elsewhere classified	135.6	135.6	5	Total goods	93.0	93.0
1183	Expenditure in restaurants and hotels	93.7	93.8				
1185	Financial services, not elsewhere classified	88.1	89.2	6	Tradable goods	97.5	97.6

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

using PPP converters are given only at the three-digit level because this is the minimum level of disaggregation which is publishable.

Comparisons over time

The evolution of the PPP for the United States and Canada over time is determined by the rates of inflation in the two countries as measured in this case by the implied national accounts deflators for the expenditure categories concerned. Over the 1960–87 period, the aggregate PPP has evolved quite steadily, whereas the exchange rate has been more volatile. (See chart 1.) Between 1975 and 1985, the exchange rate increased from 1.017 to 1.366, while the PPP for this same period increased from 1.168 to 1.255. (See table 5.)

Gross domestic product per capita from 1960 to 1987 in the United States and Canada shows a narrowing of the gap between the two countries. (See chart 2.) Real gross domestic product per capita in the United States has increased about 67 percent from the figure for 1960 and the figure estimated by the OECD for 1987. In Canada, the increase has been faster, rising from only 70 percent of the U.S. figure in 1960 to 91 percent in 1981. Since then, the proportion has

stabilized at around 90 percent.

In 1960, expenditure patterns for the components of gross domestic product were similar between Canada and the United States, ranging within 1 or 2 percentage points for each component. (See chart 3 and tables 6, 7, and 8.) However, by 1985, some changes in expenditure patterns emerged. While expenditures for government consumption and for capital were still similar (18 percent for the United States and 19 percent for Canada), gross fixed capital formation in Canada had risen to 24 percent of gross domestic product per capita by 1985, while the U.S. increase was somewhat smaller, 18 percent.

Price and volume comparisons

Exchange rate movements and relative inflation rates have combined to influence the interspatial price index of Canada relative to the United States. Canada had generally been more expensive than the United States in the sense that the PPP has always exceeded the exchange rate—sometimes by as much as 20 percent, as in 1976—at least from 1960 to 1984, when the increase in the dollar exchange rate brought Canadian prices below those of the United States. (See chart 4.) By 1985, Canadian prices were 6.3 percent

lower than in the United States. Among the components of gross domestic product, the price index for individual final consumption of goods and services, the one most interesting to individual consumers crossing the border to shop, indicates that prices for this component were 5.7 percent lower in Canada in 1987. However, the index covers such items as rent and medical care and, consequently, the weighting pattern reflects the expenditure of the average domestic consumer, not the casual visitor. It would be necessary to make a specially appropriate weighting pattern, or at least to show the detailed price indexes for specific consumer goods, for the index to be useful for those crossing the border to shop.

The volume indexes of Canadian expenditures per capita relative to the United States from 1960 to 1985 show the steady evolution (with significant stability in recent years)

of gross domestic product and individual final consumption and the peaked pattern of government final consumption and, in particular, that of gross fixed capital formation. (See chart 5.)

How parities were calculated

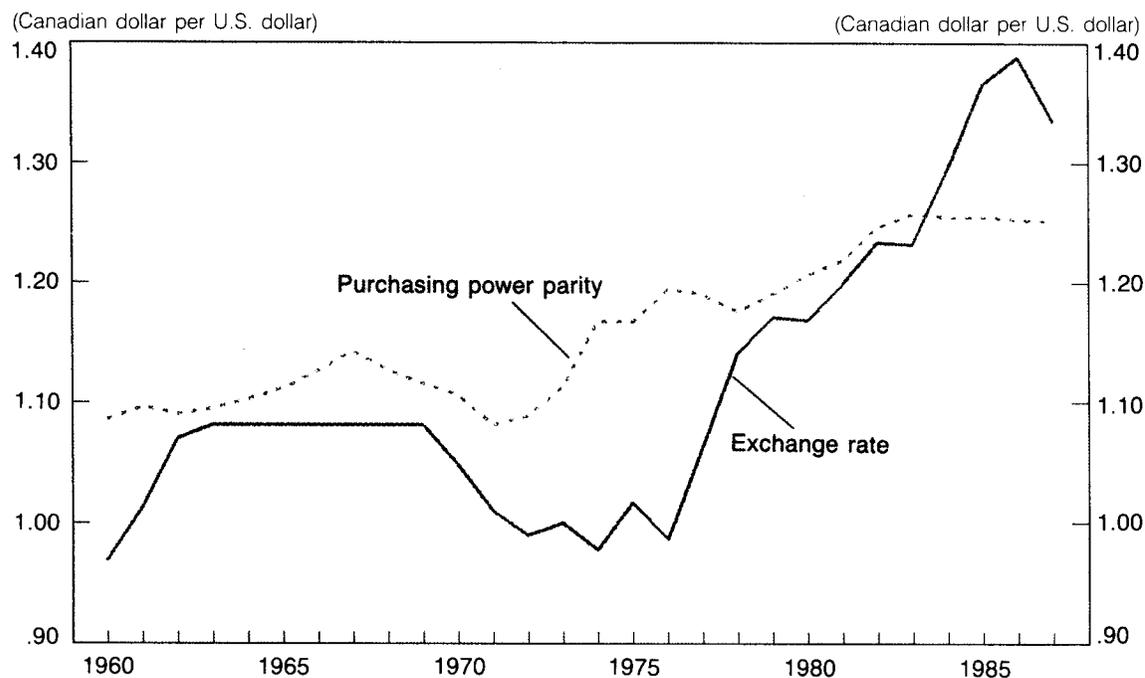
Regional comparisons. For the comparisons within the European Community (the OECD/EUROSTAT exercise), basic parities were calculated for more than 350 expenditure categories, while the non-European Communities countries were included at a more aggregated level, using 240 categories. The categories corresponded to the five-digit and four-digit levels of expenditure classifications. Several non-European Communities countries had difficulty providing the OECD with a 1985 breakdown even at the four-digit level.

Item	Purchasing power parity	Nominal expenditures (millions)		Canadian expenditures (millions) at—		Percentage of nominal expenditures		Percent of Canada real expenditures
		United States	Canada	Exchange rate	Purchasing power parity	United States	Canada	
Food, beverages, and tobacco	1.416	\$ 361,533	\$ 48,939	\$ 35,827	\$ 34,561	9.2	10.4	9.2
Clothing and footwear	1.368	168,415	18,231	13,346	13,327	4.3	3.9	3.5
Gross rent, fuel, and power	1.270	518,025	62,239	45,563	49,007	13.1	13.2	13.0
Household equipment and operation	1.426	149,474	20,071	14,693	14,075	3.8	4.2	3.7
Medical care and health expenses .....	.959	371,145	14,096	10,319	14,699	9.4	3.0	3.9
Transport and communication	1.270	408,808	45,203	33,092	35,593	10.4	9.6	9.5
Education, recreation, and culture	1.148	178,936	21,144	15,479	18,418	4.5	4.5	4.9
Miscellaneous goods and services	1.281	412,463	36,231	26,523	28,283	10.5	7.7	7.5
Net purchases abroad	1.259	13,934	1,137	832	903	.4	.2	.2
Individual final consumption	1.266	2,582,733	267,291	195,674	211,130	65.4	56.6	56.1
General public services	1.315	490,747	62,527	45,774	47,549	12.4	13.2	12.6
Education	1.325	233,451	34,599	25,329	26,112	5.9	7.3	6.9
Government final consumption	1.318	724,198	97,126	71,102	73,692	18.3	20.6	19.6
Plant and equipment	1.310	330,161	31,011	22,702	23,673	8.4	6.6	6.3
Construction and civil engineering	1.078	405,373	61,282	44,862	56,848	10.3	13.0	15.1
Gross fixed capital formation	1.163	735,534	92,293	67,564	79,358	18.6	19.5	21.1
Gross domestic product	1.255	3,946,612	472,510	345,908	376,502	100.0	100.0	100.0
Gross final consumption expenditure ..	1.263	3,306,931	364,417	266,777	288,533	83.8	77.1	75.7
Gross final expenditure	1.243	4,042,465	456,710	334,341	367,426	102.4	96.7	96.8
		Per capita expenditures				(U.S. = 100)		
		U.S. nominal (in U.S. dollars)	Canada nominal (Canadian dollars)	Canada at exchange rate (U.S. dollars)	Canada at purchasing power parity (U.S. dollars)	Price Index	Volume Index at purchasing power parity	
Food, beverages, and tobacco		\$ 1,511	\$ 1,928	\$ 1,412	\$ 1,362	103.7	90.1	
Clothing and footwear		704	718	526	525	100.1	74.6	
Gross rent, fuel, and power		2,165	2,452	1,795	7,931	93.0	89.2	
Household equipment and operation ..		625	791	579	555	104.1	88.8	
Medical care and health expenses		1,551	553	407	579	70.2	37.3	
Transport and communication		1,708	1,781	1,304	1,402	93.0	82.1	
Education, recreation, and culture		748	833	610	726	84.0	97.0	
Miscellaneous goods and services		1,724	1,428	1,045	1,114	93.8	64.7	
Net purchases abroad		58	45	33	36	92.2	61.1	
Individual final consumption		10,794	10,532	7,710	8,319	92.7	77.1	
General public services		2,051	2,464	1,804	1,874	96.3	91.4	
Education		976	1,363	998	1,029	97.0	105.5	
Government final consumption		3,027	3,827	2,802	2,904	96.5	95.9	
Plant and equipment		1,380	1,222	895	933	95.9	67.6	
Construction and civil engineering		1,694	2,415	1,768	2,240	78.9	132.2	
Gross fixed capital formation		3,074	3,637	2,662	3,127	85.1	101.7	
Gross domestic product		16,494	18,618	13,630	14,835	91.9	89.9	
Gross final consumption expenditure ..		13,820	14,359	10,512	11,369	92.5	82.3	
Gross final expenditure		16,895	17,996	13,174	14,478	91.0	85.7	

NOTE: 1985 exchange rate=1.366 Canadian dollars per U.S. dollar.

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

Chart 1. U.S.—Canadian purchasing power parity for gross domestic product and the exchange rate, 1960-87



Source: Data are from the Organization for Economic Cooperation and Development, Paris.

The timing of the calculations meant that although the control totals of at least the main aggregate of gross domestic product referred to 1985, the detailed breakdowns were for 1984 or even earlier years. Even so, gaps remained which required estimates to meet the minimum requirements of the jointly agreed methodology.

The lists of items for pricing were produced by the EUROSTAT and OECD Secretariats after consultation with experts representing the participating countries. For example, the list of consumer goods and services was determined by the EUROSTAT Price Statistics Working Party, which was attended by OECD representatives. Construction and civil engineering bills of quantities and machinery and equipment product lists were determined on the advice of two groups of national consultants (who also provided estimates of the average prices from their own research) engaged by EUROSTAT. The OECD, after consultation with its member countries, arranged for many non-European Communities products to be added to the lists of items which were characteristic and noncharacteristic and priced in European Communities countries so as to maintain a balance of the two groups of countries.

Although it would simplify matters if the lists of items could consist entirely of goods and services characteristic of all of the countries concerned and representative of the expenditure category to which they are classified, differing

national tastes mean that, in order to produce a balanced matrix of price comparisons between countries, it is necessary to measure the average prices of noncharacteristic items in some countries. These items, of course, are characteristic in at least one of the countries in the study.

Nontransitive parities for each expenditure category between two countries, say countries A and B, are calculated using a three-stage process. First, a Laspeyres-type parity is calculated by taking the geometric average of the price ratios (price in country B divided by price in base country A) of each product which is classified to the basic heading and characteristic of country A, then a Paasche-type parity is calculated using the price ratios of those products which are characteristic of country B. Finally, a Fisher-type parity is calculated as the square-root of the Laspeyres and Paasche parities multiplied together.

The transitive matrices of parities at the basic heading level involve no explicit weighting structure, for lack of reliable, representative expenditure weights to aggregate the parities for particular products. The availability of expenditure weights, from the basic level up, made possible the use of the Geary-Khamis formula, which simultaneously determines the higher level PPP's and indexes of average international prices using an iterative process.

The PPP's between two countries depend on the composition of the group of countries considered, for example, the

France-Germany parity will generally differ depending on whether these two countries are considered alone, as part of the European Communities comparison, or as part of the OECD or world comparisons.

To avoid a proliferation of published PPP results, the participating countries agreed to fix the European Communities countries as a bloc within the OECD group so that the PPP's between any two European Communities countries calculated in the European Communities exercise would be the same in the published results of the OECD exercise.

Bilateral comparisons. There are numerous important differences in the methodology which has been used in the Canada-United States bilateral comparison from that used for the multilateral study. For practical reasons, it was agreed to keep as close as possible to the four-digit classification used in the multilateral exercise, but to incorporate such changes as to eliminate most of the categories for which estimates had to be made for both of the countries concerned to complete three-digit or higher levels of disaggregation required for the multilateral calculations.

The tables in this article give real output estimates at the one-digit level (15 categories) and PPP's and interspatial price indexes at the two-digit level (46 categories). However, at the three- and four-digit levels, there is a further breakdown, not shown explicitly, as follows:

	Number of categories			
	One-digit	Two-digit	Three-digit	Four-digit
Private final consumption	9	32	74	158
Government final consumption	2	6	24	24
Gross fixed capital formation	2	6	24	30
Change in stocks	1	1	1	1
Net exports of goods and services	1	1	1	1
Total	15	46	124	214

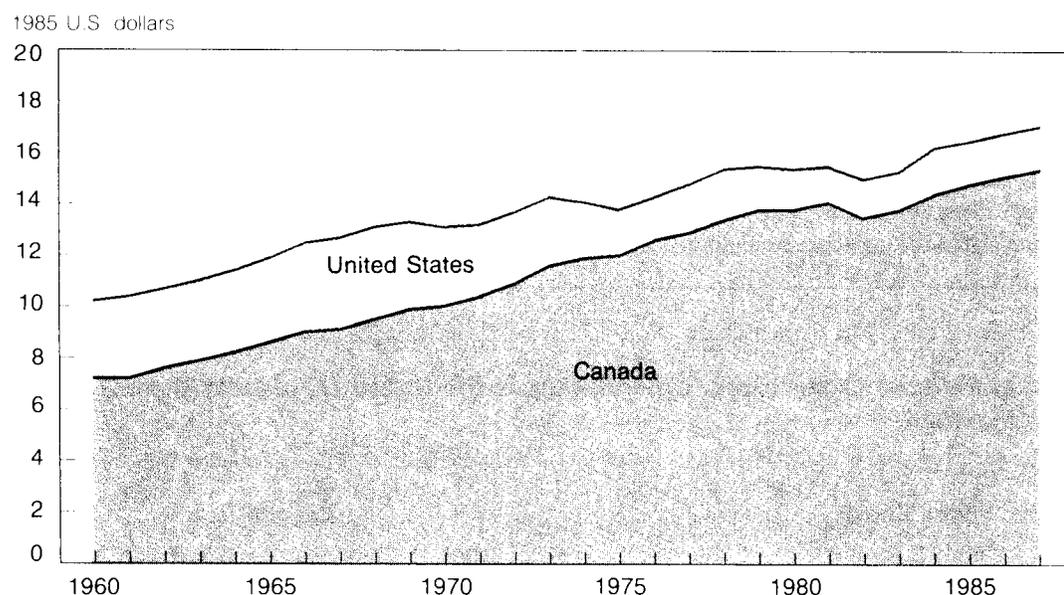
For example, the two-digit "food" category breaks down into 10 three-digit categories: bread and cereals; meat; fish; dairy products; oils and fats; and so forth. (See table 2.) In turn, the three-digit category "bread and cereals" breaks down into six four-digit categories covering rice; flour and other cereals; bread; other bakery products; pasta; and other cereal products. The expenditure breakdown provided by the national accounts offices of the United States and Canada and suitably supplemented by information from family expenditure surveys and by OECD Secretariat estimates is not intended to be an official one at the three- or four-digit level, except in certain categories such as food. Rather, the finer levels of disaggregation are used to provide some reasonable alternative to the "default" weighting sys-

Table 5. Canada-U.S. bilateral comparisons, gross domestic product, 1960-87

	Purchasing power parity	Exchange rate	Nominal expenditures (billions)		Canada at exchange rate (billions of U.S. dollars)	Canada at purchasing power parity (billions of U.S. dollars)	1985 deflator	
			United States (U.S. dollars)	Canada (U.S. dollars)			United States	Canada
1960	1.086	0.970	\$ 513.6	\$ 38.7	\$ 39.9	\$ 35.6	27.7	24.0
1965	1.112	1.081	701.7	57.2	52.9	51.4	30.3	26.8
1970	1.106	1.048	1,009.2	88.5	84.4	80.0	37.7	33.2
1975	1.168	1.017	1,583.9	170.1	167.3	145.6	53.2	49.5
1980	1.207	1.169	2,688.5	307.7	263.2	255.0	76.9	73.9
1981	1.219	1.199	3,009.5	353.5	294.8	290.0	84.3	81.9
1982	1.247	1.234	3,121.4	372.0	301.4	298.3	89.7	89.1
1983	1.258	1.232	3,353.5	401.8	326.1	319.5	93.2	93.3
1984	1.255	1.295	3,713.0	439.8	339.6	350.5	96.8	96.7
1985	1.255	1.366	3,946.6	472.5	345.9	376.5	100.0	100.0
1986	1.252	1.389	4,166.7	498.8	359.1	398.5	102.8	102.5
1987	1.251	1.336	4,420.4	527.9	395.2	421.9	105.8	105.5
Per capita expenditures							(U.S. = 100)	
	United States (U.S. dollars)	Canada nominal (Canadian dollars)	Canada at exchange rate (U.S. dollars)	Canada at purchasing power parity (U.S. dollars)	Price index	Per capita volume index		
1960	\$ 2,843	\$ 2,162	\$ 2,229	\$ 1,990	112.0	70.0		
1965	3,611	2,904	2,687	2,612	102.9	72.3		
1970	4,922	4,148	3,958	3,752	105.5	76.2		
1975	7,334	7,485	7,360	6,406	114.9	87.3		
1980	11,804	12,785	10,937	10,594	103.2	89.8		
1981	13,077	14,506	12,098	11,901	101.7	91.0		
1982	13,424	15,085	12,225	12,097	101.1	90.1		
1983	14,282	16,133	13,095	12,829	102.1	89.8		
1984	15,665	17,489	13,505	13,939	96.9	89.0		
1985	16,494	18,618	13,629	14,835	91.9	89.9		
1986	17,241	19,481	14,025	15,561	90.1	90.3		
1987	18,110	20,433	15,294	16,328	93.7	90.2		

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

Chart 2. Real gross domestic product per capita, United States and Canada, 1960-87



NOTE: Canadian dollar converted to U.S. dollar using purchasing power parities.

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

tem of simply averaging together the price relatives of all items on the list falling into some indivisible category. Thus expenditure estimates for a given category may be acceptable as weights for the calculation of PPP's, but may not come up to the level of statistical acceptability required for publication. Several features of expenditure breakdown used in the bilateral comparison differ significantly from the features used in either the national accounts of the United States and Canada or the standard sets of accounts published by the OECD. These features were adopted to attempt a more meaningful comparison between the two countries:

- Private nonprofit-making institutions are included together with consumers' expenditure in the category of private final consumption.
- Private consumption expenditure for general government services has been netted out across intermediate consumption by general government services, as breakdowns of government costs of providing such services are not available.

A major problem of comparison arises when considering education and health because of the different relative shares of the market and nonmarket sectors in the United States and Canada. In the case of health, even the means adopted by the government to finance nonmarket services cause the payments to be treated in completely different ways. Ac-

cordingly, all market services of education were transferred to the general government sector, leaving only the driving school/language course activities in the private sector. In contrast, all nonmarket services of health care were transferred to the private sector—all categories under "medical care and health expenses" such as medical and pharmaceutical products, therapeutic appliances and equipment, medical services outside hospitals, hospital care, and the like. Clearly, although the ways in which price comparisons are estimated for market and nonmarket services of these categories differ significantly, an alternative method of presenting the revaluation of these services in the two countries is possible by keeping the relative shares of the market and nonmarket services of education and health firmly in the private and public sectors, and reweighting detailed parities appropriately to give alternative PPP estimates to these two items. It should be noted that this treatment differs from that adopted in the OECD/EUROSTAT multilateral exercise where all services of both education and health were transferred in their entirety to the private sector.

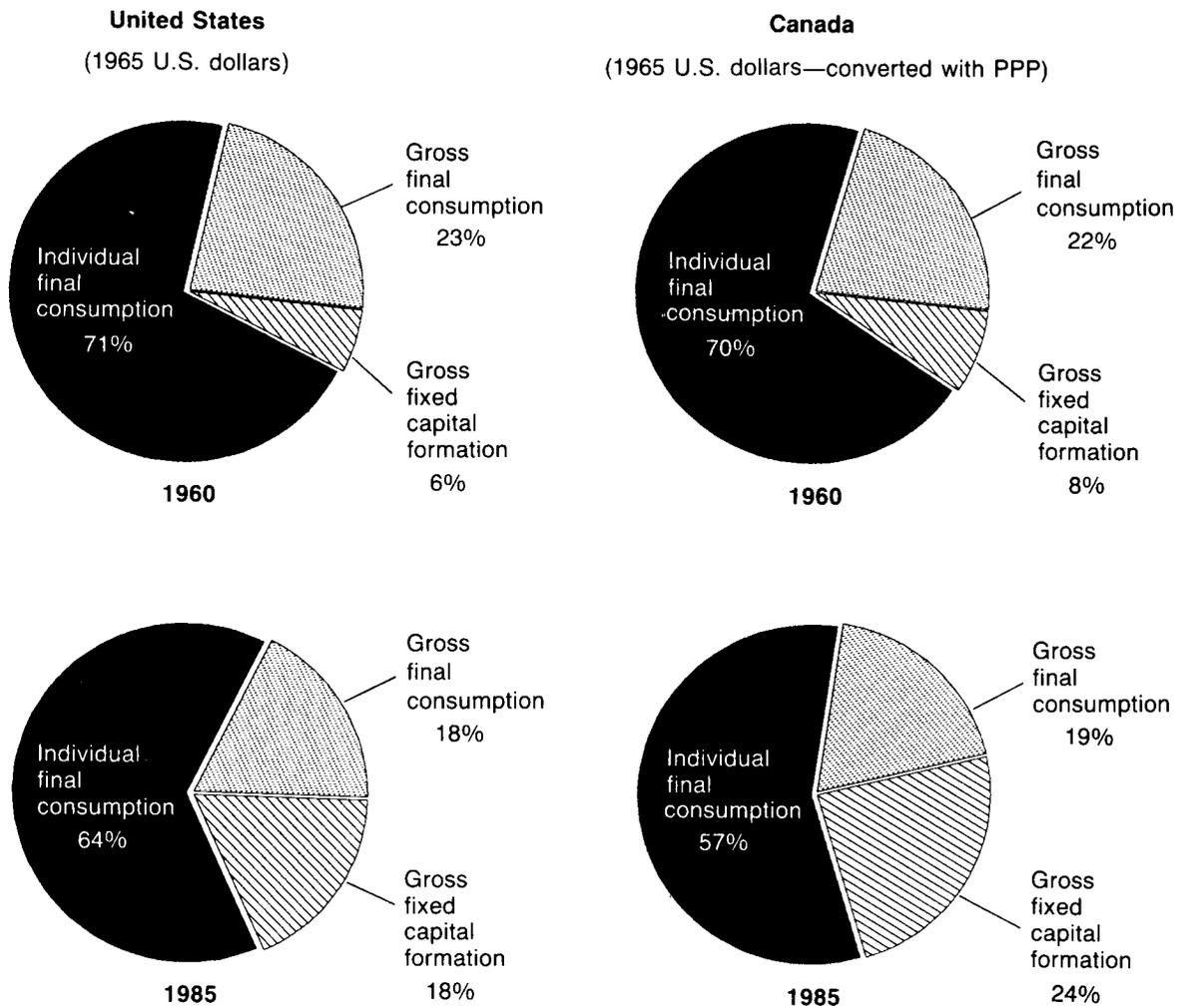
Characteristics markings. In the context of a bilateral comparison between Canada and the United States, the use of items deemed characteristic of both countries to achieve balanced parities is generally agreed to be less important than it would have been between two less similar countries.

Although there are clear differences in the expenditure patterns of Canada and the United States, at the basic heading level, those products deemed characteristic of one country were also usually characteristic of the other. Rather few items were considered noncharacteristic in the bilateral study, and thus the "index-number spread" (ratio between Laspeyres and Paasche indexes) was rather low, particularly at the basic heading level, although at higher levels of aggregation this tended to increase a little. It is worth remembering in this context, however, that because of the difficulty experienced by the Canadian national accounts office in providing a gross domestic product expenditure breakdown

on the special classification used for the PPP exercise, it was frequently necessary to use the United States' expenditure pattern to break down Canadian expenditure estimates, particularly at the finest level of detail.

A separate, but closely connected, issue is the representativeness of the selected products. The requirement that the products be representative of the main category is, perhaps, even more important than the requirement that they be characteristic of the countries being compared. (Here, "representative" refers to the average Canada/U.S. price level of the goods and services falling into the basic expenditure category.)

Chart 3. Patterns of per capita expenditures in the United States and Canada, 1960 and 1985



SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

Table 6. Canada-U.S. bilateral comparisons, individual final consumption, 1960-87

Year	Purchasing power parity	Exchange rate	Nominal expenditures (billions)		Canada at exchange rate (billions of U.S. dollars)	Canada at purchasing power parity (billions of U.S. dollars)	1985 deflator	
			United States (U.S. dollars)	Canada (U.S. dollars)			United States	Canada
1960	1.078	0.970	\$ 328.1	\$ 25.2	\$ 26.0	\$ 23.4	30.5	26.0
1965	1.084	1.081	438.5	34.4	31.8	31.7	33.1	28.3
1970	1.101	1.048	635.8	51.3	48.9	46.5	39.6	34.5
1975	1.115	1.017	1,005.8	96.3	94.6	86.3	54.2	47.7
1980	1.151	1.169	1,721.2	170.4	145.8	148.0	77.9	70.8
1981	1.178	1.199	1,909.7	193.8	161.7	164.6	84.7	78.8
1982	1.226	1.234	2,046.3	209.9	170.1	171.2	89.6	86.8
1983	1.248	1.232	2,223.7	229.1	186.0	183.5	93.2	91.9
1984	1.255	1.295	2,418.1	248.0	191.5	197.6	96.9	96.0
1985	1.266	1.366	2,584.3	271.0	198.4	214.1	100.0	100.0
1986	1.287	1.389	2,748.1	291.7	210.0	226.6	102.3	104.0
1987	1.259	1.336	2,915.5	308.7	231.1	245.1	105.3	104.7
Per capita expenditures							(U.S. = 100)	
	United States (U.S. dollars)	Canada nominal (Canadian dollars)	Canada at exchange rate (U.S. dollars)	Canada at purchasing power parity (U.S. dollars)	Price index	Per capita volume index		
1960	\$ 1,816	\$ 1,410	\$1,453	\$1,308	111.1	72.0		
1965	2,257	1,747	1,616	1,612	100.2	71.4		
1970	3,101	2,404	2,294	2,182	105.1	70.4		
1975	4,657	4,235	4,164	3,799	109.6	81.6		
1980	7,557	7,080	6,056	6,150	98.5	81.4		
1981	8,298	7,955	6,635	6,755	98.2	81.4		
1982	8,801	8,513	6,898	6,942	99.4	78.9		
1983	9,470	9,199	7,467	7,369	101.3	77.8		
1984	10,202	9,861	7,615	7,858	96.9	77.0		
1985	10,800	10,678	7,817	8,434	92.7	78.1		
1986	11,371	11,391	8,201	8,850	92.7	77.8		
1987	11,944	11,948	8,943	9,487	94.3	79.4		

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

A difficulty with the product lists initially produced by EUROSTAT for the European Communities comparison was that whole areas were lacking in products characteristic and representative of North America. It was not possible to make the comparison valid simply by adding a few North American items for reciprocal pricing in other geographical zones. It was necessary to add entire product lists to establish the Canada-United States relationship—private automobiles was an obvious example.

In general, then, in most of the 669 products for which prices were obtained in both countries, characteristic markings were assigned for both countries. This was also necessary for practical reasons: First, in proposing products for pricing, a country nominates only its own characteristic items; second, the other country is able to price the items from its ongoing statistical surveys if the items are also characteristic of that country. If it is necessary to mount a special price collection survey, it would be composed mainly, if not exclusively, of characteristic items.

In a few cases, however, the absence of a characteristic marking has more to do with reliability associated with the price estimate than with characteristic representativeness. The participants believed that price estimates derived from small samples should simply have a lower weight than the others in calculating the basic parities.

Parities. In contrast to the multilateral purchasing power parity project where a one/zero weighting system was adopted, in the bilateral project, products characteristic of both countries were assigned a weight of 2 and noncharacteristic products, a weight of 1 in calculating the basic parities, because the analysts believed that all price ratios should be taken into account to some extent. In all calculations, the U.S. dollar was the numeraire currency used, and also the United States was considered the base country.

Thus, at the basic heading level, the Laspeyres parity is the weighted geometric average of all associated price ratios (expressed in terms of Canadian dollars per U.S. dollar), a weight of 2 being assigned to those price ratios of products which are characteristic of the United States and a weight of 1 assigned to those noncharacteristic products. Similarly, the Paasche parity uses the same products, but the weighting pattern is that of the Canadian characteristic markings.

Two methods of averaging have been used to pull together the Laspeyres-type ("United States prices") and Paasche-type ("Canadian prices") basic parities. The first is a Fisher index. It is calculated as the geometric mean of the Laspeyres and Paasche parities. The second method is a Tornqvist-type index. It is calculated directly from the price ratios of the products. It is a weighted geometric average of the price ratios, and the weight assigned to a given price ratio is the arithmetic average of the characteristic scores of

Table 7. Canada-U.S. bilateral comparisons, government final consumption, 1960-85

Year	Purchasing power parity	Exchange rate	Nominal expenditures (billions)		Canada at exchange rate (billions of U.S. dollars)	Canada at purchasing power parity (billions of U.S. dollars)	1985 deflator	
			United States (U.S. dollars)	Canada (U.S. dollars)			United States	Canada
1960	0.906	0.970	\$ 85.4	\$ 5.3	\$ 5.4	\$ 5.8	24.3	16.7
1965	919	1.081	117.4	8.2	7.6	9.0	27.9	19.5
1970	970	1.048	189.6	16.4	15.6	16.9	37.1	27.3
1975	1.056	1.017	294.2	33.1	32.6	31.4	54.0	43.2
1980	1.163	1.169	473.7	59.1	50.6	51.8	77.9	68.7
1981	1.215	1.199	525.6	68.6	57.2	56.5	84.4	77.8
1982	1.276	1.234	574.1	77.6	62.9	60.8	89.6	86.8
1983	1.277	1.232	617.0	82.9	67.3	64.9	94.9	91.9
1984	1.282	1.295	666.6	89.1	68.8	69.5	98.5	95.8
1985	1.318	1.366	722.7	94.8	69.4	71.9	100.0	100.0
Per capita expenditures							(U.S. = 100)	
	United States (U.S. dollars)	Canada nominal (Canadian dollars)	Canada at exchange rate (U.S. dollars)	Canada at purchasing power parity (U.S. dollars)	Price index	Per capita volume index		
1960	\$ 473	\$ 294	\$ 303	\$ 324	93.4	68.6		
1965	604	419	387	455	85.4	75.4		
1970	925	769	733	792	92.6	85.7		
1975	1,362	1,458	1,434	1,382	103.8	101.4		
1980	2,080	2,455	2,100	2,111	99.5	101.5		
1981	2,284	2,816	2,348	2,318	101.3	101.5		
1982	2,469	3,148	2,551	2,467	103.4	99.9		
1983	2,628	3,327	2,701	2,606	103.6	99.2		
1984	2,813	3,544	2,737	2,765	99.0	98.3		
1985	3,020	3,735	2,734	2,834	96.5	93.8		

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

the product in the two countries—for example, if a product is characteristic of the United States (weight 2) but noncharacteristic of Canada (weight 1), the Tornqvist weight is 1.5.

Aggregations. The basic headings are defined by the available level of disaggregation of expenditure weights and, as noted, correspond to a modified version of the four-digit classification adopted by EUROSTAT and the OECD for the multilateral program. Aggregation of the Laspeyres, Paasche, and Tornqvist indexes from the four-digit to three-digit level (and then to higher levels) is made by calculating weighted geometric averages of the four-digit parities.

The Laspeyres parity of a three-digit category is a weighted average of the Laspeyres four-digit parities with U.S. expenditures of the four-digit categories as weights. The three-digit Paasche parity uses Canadian expenditures to aggregate the four-digit Paasche parities. The three-digit Tornqvist indexes weight together the four-digit Tornqvist indexes, using as weights the arithmetic average of the expenditure of that category in the United States expressed as a percentage of U.S. gross domestic product and the expenditure of that category in Canada expressed as a percentage of Canadian gross domestic product.

The Fisher indexes at any level are compiled directly from the Laspeyres and Paasche indexes at the same level, and not from Fisher indexes at the level immediately below. The method of calculation is described in the discussion of the basic parities.

The procedure for aggregation to higher levels is exactly the same, right up to gross domestic product level.

There are several cases where, despite serious attempts by the Bureau of Labor Statistics and Statistics Canada to fill all gaps, no matched product was found in a given main category. For the purposes of the first stage of aggregation, the basic parity for these categories was assumed to be equal to that of the weighted average of the others; or, equivalently, equal to that of the next higher level category.

The only exception concerns net exports of goods and services. Even though many third countries are involved, the U.S.-Canada exchange rate has been assumed for this category. No attempt was made to calculate special parities for exports and imports.

Indirectly calculated parities. The first stage of aggregation covers what might be called the directly calculated parities but, for many categories, no attempt was made to price directly. At the completion of the first stage, it is possible to fill many blanks with indirectly calculated parities.

For collectively consumed services of general government and education and, in the private sector, hospital care and the like, the input approach is used for pricing. The three types of inputs are: compensation of employees (directly measured by surveying wages and salaries and other compensation); intermediate purchases; and depreciation (capital consumption) of fixed assets. The latter two cate-

Table 8. Canada-U.S. bilateral comparisons, gross fixed capital formation, 1960-85

Year	Purchasing power parity	Exchange rate	Nominal expenditures (billions)		Canada at exchange rate (billions of U.S. dollars)	Canada at purchasing power parity (billions of U.S. dollars)	1985 deflator	
			United States (U.S. dollars)	Canada (U.S. dollars)			United States	Canada
1960	1.067	0.970	\$ 92.4	\$ 8.5	\$ 8.7	\$ 7.9	30.3	27.8
1965	1.219	1.081	131.6	13.7	12.6	11.2	31.3	32.8
1970	1.156	1.048	17.8	19.0	18.1	16.4	39.2	39.0
1975	1.219	1.017	272.3	41.8	41.1	34.3	58.9	61.8
1980	1.064	1.169	514.3	72.3	61.8	67.9	89.3	81.7
1981	1.055	1.199	559.3	86.1	71.8	81.6	96.1	87.2
1982	1.088	1.234	537.6	81.6	66.1	75.0	98.8	92.5
1983	1.112	1.232	577.6	81.4	66.0	73.2	98.3	94.0
1984	1.140	1.295	671.7	84.3	65.1	73.9	98.4	96.5
1985	1.163	1.366	735.5	92.6	67.8	79.7	100.0	100.0
Per capita expenditures							(U.S. = 100)	
	United States (U.S. dollars)	Canada nominal (Canadian dollars)	Canada at exchange rate (U.S. dollars)	Canada at purchasing power parity (U.S. dollars)	Price index	Per capita volume index		
1960	\$ 511	\$ 473	\$ 488	\$ 443	110.0	86.7		
1965	677	694	642	570	112.7	84.1		
1970	870	892	851	771	110.3	88.6		
1975	1,261	1,841	1,810	1,510	119.9	119.8		
1980	2,258	3,003	2,569	2,822	91.0	125.0		
1981	2,430	3,534	2,948	3,349	88.0	137.8		
1982	2,312	3,309	2,681	3,041	88.2	131.5		
1983	2,460	3,267	2,652	2,939	90.2	119.5		
1984	2,834	3,351	2,587	2,938	88.1	103.7		
1985	3,074	3,650	2,672	3,139	85.1	102.1		

SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

gories are estimated indirectly. For example, the parity corresponding to intermediate expenditures of nonmarket services of education pertaining to food is assumed to be equal to that for private consumption expenditures on food, and the parity for depreciation is assumed to be equal to that calculated for gross domestic fixed capital formation.

The other cases are (1) capital investment in passenger cars: The parity for private consumption expenditure on passenger cars is weighted together with that directly calculated for commercial vehicles in proportion to the approximate expenditure on the two types of vehicle; and (2) change in stocks: The parity for change in stocks is assumed to be that for total goods. The latter is calculated by weighting together the parities for all those categories classified as goods in the United Nations System of National Accounts.

Final estimation of missing basic parities. At this stage, directly and indirectly calculated basic parities have been set, and it is possible to fill in the remainder. A "top-down" routine is used to examine each category and, if necessary, fill in the missing value by taking the next available higher level parity. Thus, any missing parity for a major aggregate would be filled in using the gross domestic product parity, any missing parity for one-digit categories will be filled in using the major aggregates, two-digit categories will be filled in using the one-digit categories, and so forth, until all four-digit categories are accounted for.

In fact, in the Canada-United States exercise, very few categories needed to be filled in using this procedure, as data

collection had been designed to cover as many categories as possible by direct or indirect means.

Operational procedures—United States

Private consumption. The private consumption specifications developed for the multilateral regional study were used as a basis for the United States-Canadian bilateral comparison. However, the bilateral specifications were tailored to better reflect the United States and Canadian markets. For instance, the sizes required by some of the multilateral specifications were changed because product sizes tend to be larger in the United States and Canada than in the rest of the OECD countries. Any specification that either the United States or Canada could not price was dropped from consideration. Many brand specific product specifications were also deleted because Canadian and U.S. consumer price index (CPI) product categories, in general, do not indicate brands. New product and service specifications were developed to strengthen areas which had weak coverage by either country in the multilateral project. Additional specifications were also created for categories where the price-determining characteristics in Canada and the United States differed from those required by the multilateral specifications (insurance, for example).

Once specifications were developed, the Bureau of Labor Statistics determined which data sources were appropriate for each product area. The major source was the Bureau's CPI data base and related publications. While the CPI covers all aggregate product areas of U.S. private consumption,

because of sampling techniques, some of the detailed products included in the OECD specifications are not priced in the CPI. In those cases, the OECD referred to other data sources, such as published surveys of prices for motorcycles, catalogs for furniture and clothing, U.S. Department of Commerce data for fish, and airline companies for air fares. However, outside sources were used only as a supplement; the CPI average prices for food and energy categories were used whenever possible. In the case of insurance, two types of policies were priced, tenant and automobile. For both types, a special data base was constructed from information and prices collected by the CPI to match the OECD specification. The specification for tenant insurance used for both the multilateral and the bilateral projects was slightly different from the typical configuration found in the United States, particularly with regard to coverage for theft and current value versus replacement value. However, it was possible to adjust the available data to account for these differences. For automobile insurance, the multilateral specification was impossible to match, largely because of the wide discrepancy in levels of liability coverage between European-based policies and North American policies. As a result, for the multilateral project, the United States matched the Canadian CPI specification for automobile insurance and linked into the OECD regional comparison through Canada, which had conducted a special survey to match the European specification,

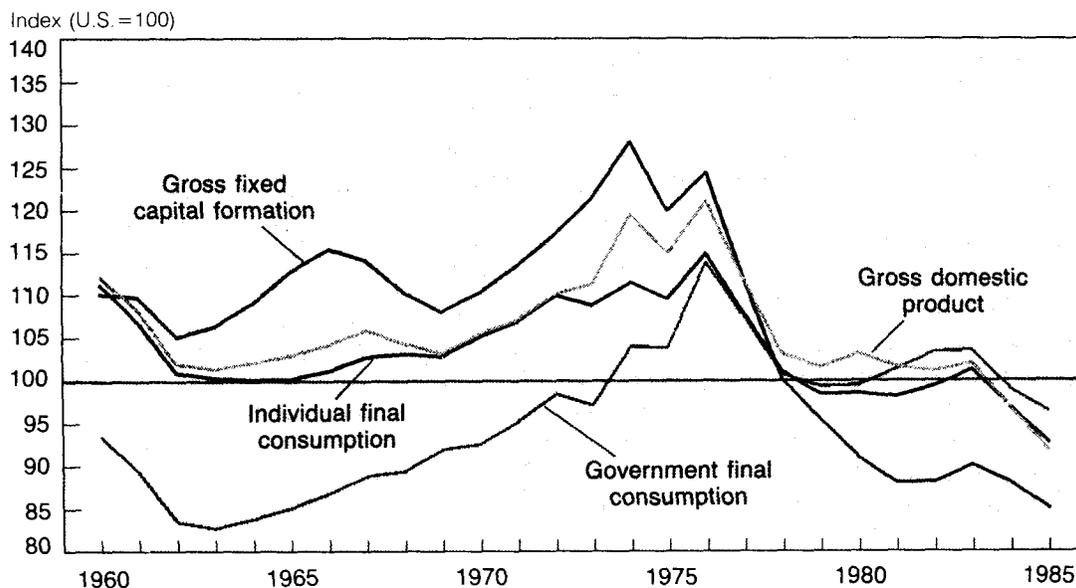
while the U.S.-Canada specification was used for the bilateral comparison.

All prices extracted from the CPI data base were subjected to a sanitization process before being transmitted to the OECD. Each price quote was examined for indications of brand, model, and company or outlet and, where necessary, this type of information was removed to ensure confidentiality.

For the most part, the actual calculation of U.S. average prices was carried out by the OECD. The methodology ranged from a straight arithmetic average to a regression on several variables, depending on the particular characteristics of the product. A straight arithmetic average was used on specifications for homogeneous products for which the United States had exact matches; for example, produce, meats, haircuts, and domestic help. Often a weighted average was needed, as in the case of fish prices where CPI quotes were supplemented with the prices published by the Department of Commerce, and the two quotes were weighted to form one national average price. Frequently, while prices to be averaged were for a homogeneous product, the unit of size provided by the United States differed from the specified unit of size. This occurred because most U.S. goods are not measured in metric units, unlike Canadian goods.

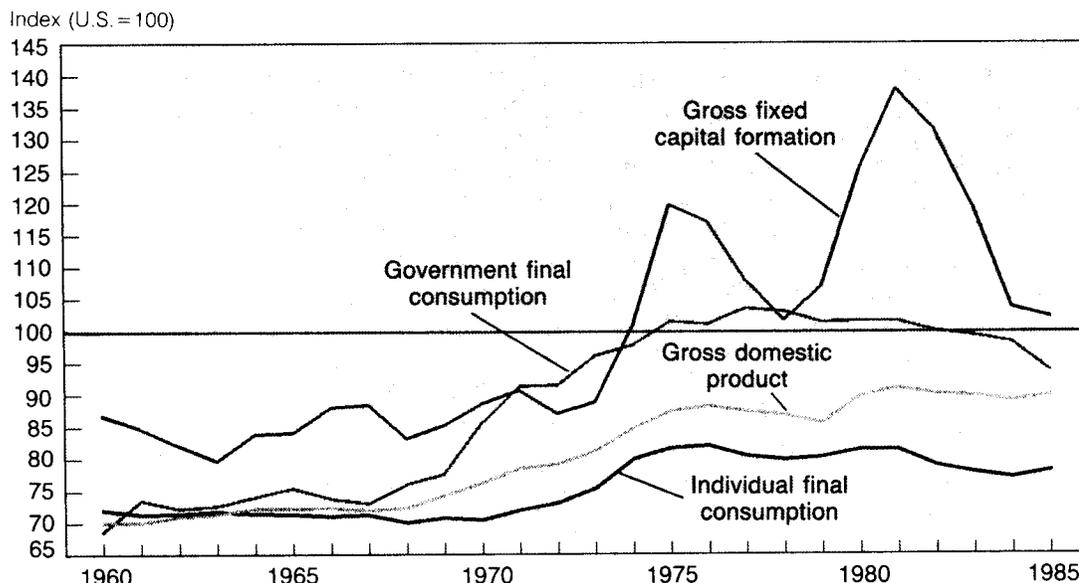
Occasionally, the food and the household goods specifications required a size that was unavailable in the United

Chart 4. Canadian price levels relative to those of the United States, 1960-85



SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris

Chart 5. Volume index of Canadian per capita expenditures relative to those of the United States, 1960-85



SOURCE: Data are from the Organization for Economic Cooperation and Development, Paris.

States, even though the products themselves were available and were priced by the CPI. For these items (detergents or canned foods, for example), the price quotes extracted from the CPI were used as observations in a regression on size. Once the relationship between price and size was estimated, an average price was calculated for the size required by the specification. If other characteristics, in addition to the size of the product, were identified as price determining, then a more detailed regression model was developed which included these variables. This type of application was needed for durable goods such as refrigerator-freezers where the price depended on factors such as automatic defrosters, ice makers, and color, as well as size. The price effects of these types of options were combined to estimate a price for the refrigerator-freezer described in the specification. Another category requiring special pricing techniques was rent. Here, a combination of hedonic regression (where rental values were assumed to be determined by a variety of physical, social, and environmental characteristics) and direct comparison was used.

After calculating the average prices for July 1985 using the methodology best suited to the product area, sales tax was added where required, with the Bureau of Labor Statistics providing the OECD with the appropriate data. Products within each basic category were then selected to serve as the

characteristic products for the United States in preparation for calculation of the actual parities.

Gross fixed capital formation. The procedures followed to price machinery and equipment were similar to those used to price consumer goods. The OECD multilateral specifications for machinery and equipment were used as the starting point for development of the bilateral specification. Although a great deal of work had already been done by the Bureau of Labor Statistics Industrial Price Program in 1983 and 1984 to augment and adjust the 1985 multilateral specification to reflect the U.S. market, the parties believed a number of areas remained weak, at least in terms of a U.S.-Canada bilateral comparison. Consequently, Statistics Canada and the Bureau undertook a further refinement of existing specifications, particularly with regard to the terms of each transaction, and in a few areas added new specifications to better reflect the North American market.

After obtaining the specifications, the industrial price data base and the export-import data base were searched for exact matches. A detailed review of each match was carried out by the appropriate industry analyst, and each company was contacted to obtain permission to use the data it reported to the Bureau and to assist in making any necessary adjustments to arrive at the market price.

The final data were then sanitized of any confidential information and sent to the OECD for calculation of the parities. Additional review of matched products and the resulting parities was conducted by the staff from Statistics Canada, the Bureau, and the OECD Secretariat before the actual price data were finalized.

The pricing of gross fixed capital formation in construction was carried out by the "bill of quantities" method. That is, bills of quantities corresponding to carefully specified construction projects were compiled by experts engaged by EUROSTAT for their own exercise. The list, which covered dwellings and buildings for public and commercial use as well as civil engineering projects, was adopted by the OECD for the wider project after canvassing suggestions for additional bills of quantities from non-European Communities countries, the objective being to improve the balance of the list. In the event, only one addition was made in a Scandinavian-type wooden house. Although a North American-type house was proposed, it was not possible to develop the specification to the level required for adoption in the 1985-based project.

In Canada, the Construction Prices Section of Statistics Canada estimated prices for most of the construction projects and provided them to the OECD Secretariat. However, such estimates are not available from official sources in the United States.

The OECD engaged a consulting firm which had significant experience in the preparation of cost estimates for construction projects. An immediate problem faced by the Canadian and U.S. experts was that the specifications (developed by EUROSTAT's consultants and expressed in specialized European terminology) were unusable in the North American context. A few of the specifications had been "translated" into North American terminology by Statistics Canada in the context of the 1980-based exercise and were adapted with only minor modifications for the purposes of the 1985 study. Further "translations" were carried out by Statistics Canada and by the consulting firm, Hanscomb Associates. The difficult and time-consuming part of the job, and the part which required the most expertise, was the development of the bills of quantities expressed in North American terminology. Once that stage had been completed, provisional pricing was carried out relatively quickly. Problems were discussed (and resolved to the greatest extent possible) at a meeting between representatives of Statistics Canada and Hanscomb Associates.

The U.S. data were supplied by Hanscomb Associates on the basis of estimates of national average prices, as regional variation of construction costs is known to be significant.

Unfortunately, there were some unresolved problems. There was a feeling that even after discussion between the two parties and the OECD Secretariat and after rejection of outliers, several of the U.S. prices seemed surprisingly high relative to the Canadian prices.

Public consumption. The cost of general public administrative and educational services of governments as reflected

in the wages and salaries of 25 job categories was obtained from data provided by the Bureau of Labor Statistics, the U.S. Office of Personnel Management, State governments, and various associations. Federal data were produced by the Office of Personnel Management from a data base for the complete universe, while State data were obtained from published reports for a sample of 21 States, which were selected on the basis of geographic location and level of employment. Average salaries for the more than 81,000 local governments in the United States were not available; however, data for more than 30 percent of the job categories were available for municipal and county governments which account for 50 percent of existing local governments. These data were used to represent all local government wherever possible. However, for job categories that were not covered, or not covered at a sufficiently disaggregated level, the all-State average was used as a proxy on the assumption that local government salaries are more likely to trend with State salaries than with Federal salaries. In a few cases, sources outside this framework were used if they were the result of a more complete national survey. Generally, the data came from professional associations or federations such as the National Education Association or the American Association of University Professors. The average wages derived for each of the three components, Federal, State, and local, were then combined using aggregate employment levels for each component for each job category.

Operational procedures—Canada

Private consumption—data based on regular surveys. The two regular price surveys whose data were extensively used for the multilateral and bilateral comparisons are: the Consumer Price Index (CPI) Survey and the Average Retail Price (ARP) Survey. The ARP Survey provides data closer to the purpose of international comparisons in the sense that it is explicitly designed to produce national average prices, based on information collected four times a year in 26 cities. It covers 60 basic food and grocery items, and many of them were good matches with the OECD specifications.

The CPI Survey is designed to measure price change over time and involves more than 600 commodities. Only a few of the commodities matched the OECD specifications closely enough to be used directly. For many others, a sub-selection of price data was necessary for the purpose of multilateral comparisons to establish as good a qualitative correspondence with the OECD specifications as possible. For the bilateral comparison, however, it was decided that, in most cases, the complete CPI selection is more typical of North American consumption, and hence, more directly comparable with its counterpart from the U.S. CPI samples. Although this is generally true, the comparability was weaker for some items, particularly in the area of clothing and furniture, for which there was quite a large sample dispersion of Canadian prices. The average Canadian prices in each category were estimated as weighted means of average CPI prices

for particular urban center strata in a given month of 1985. They were adjusted to the average 1985 level using the corresponding consumer price indexes.

Private consumption—data based on special procedures. In some areas of household expenditures, special procedures had to be applied to obtain the best possible multilateral or bilateral comparability, while using the available price data. The most important cases of the use of special procedures are described below. In addition to these cases, several Canadian prices were estimated through the use of published list prices, including tariffs for public utilities, provincial price lists for alcoholic beverages and a few other specific items (for example, IKEA price catalogs for some furniture items explicitly designated by the OECD).

Individual data for 1985, as recorded in the rent survey, were provided to the OECD. They included rent levels as well as multiple characteristics of both the dwelling and the tenancy agreement. For the owner-occupied dwellings, a cross-tabulation by the number of bedrooms and the age class of dwellings, estimated by the Household Surveys Divisions of Statistics Canada on the base of the May 1985 Household Facilities and Equipment Survey, was also provided. These individual data were edited and aggregated by the United Nations Statistical Office to produce internationally comparable rent levels.

For the U.S.-Canada bilateral comparisons, an average Canadian price was estimated for each of the automobile specifications priced in the regular CPI survey in November 1985. These prices relate to the base model with specified options, after dealer's discount and inclusive of transportation and predelivery charges as well as of the applicable sales taxes. The average Canadian registration fees were provided separately and added to the prices. The national averages were estimated from the average prices for 10 Canadian provinces, weighted by the number of car registrations in each province. The adjustment factors to the average 1985 price level were provided.

In the area of health services, except for dentists' fees, for which the regular CPI data were used, the only other Canadian price information provided were fees for a consultation and a home visit by a general practitioner and for a consultation by a specialist (ophthalmologist). These fees were derived from provincial fee schedules as of mid-1985 and were averaged using provincial population numbers as weights.

For pharmaceuticals, item matching and price estimation were done by the Bureau of Drug Quality of Health and Welfare Canada. For prescription drugs, price lists provided by major national drug wholesalers for January 1985 were used and estimated average prescription fees were added. For the nonprescribed drugs, retail prices suggested by the wholesaler were used. For all drugs, the adjustment to the average 1985 price level was performed using the CPI for medical and pharmaceutical products.

For the purpose of bilateral comparisons, the standard CPI specifications related to automobile and homeowners' and tenants' insurance were used. Tariff tables from various insurance companies (at least one per province) were used to obtain average provincial premiums, which were then weighted to obtain a national average.

Private consumption—data based on special surveys. Special price surveys were conducted in November-December 1985 in three cities (Montreal, Toronto, and Vancouver) to fill the gaps in Canadian price information, particularly in the cases of restaurant meals and clothing and furniture items for which the regular CPI and the OECD specifications were far apart. Although these surveys provided price data for closely matching specifications, the number of obtained price quotations was, in some cases, rather small.

Car rental rates were the subject of another special survey, which was conducted by telephone across the country. Unfortunately, there was a very large regional differentiation in typical rental contracts, particularly with respect to the free distance included in the basic rate, which made comparability of the price data difficult, in spite of all the adjustments performed.

Gross fixed capital formation. Canadian prices for machinery and equipment used in both the multilateral and bilateral comparisons were collected through a special price survey. The survey was conducted for Prices Division of Statistics Canada by a consulting firm engaged to supply nonconfidential purchase prices and related information for 168 capital equipment goods. (Eventually 175 items were priced, 108 of which were included in the U.S.-Canadian bilateral comparison.)

Considerable effort was made to include items representative of all areas of machinery and equipment in a balanced mix characteristic of the European market (those from the initial OECD lists) and the North American market. Preparatory consultations were held between officials of the Bureau of Labor Statistics and Statistics Canada to find out the broad characteristics of the varieties priced in the United States and to consider them in the Canadian survey. In some areas, though, representation could not be achieved because the specification lists did not cover, or only partly covered, the equipment for such industries as forestry; pulp and paper; mining; and oil and natural gas exploration, production, and refining.

The consulting firm was asked to conform as closely as possible to the specifications and general rules of price collection established by the OECD for the 1985 comparison round. Consequently, it attempted to provide the best estimates of average purchase prices (that is, "firm" prices) quoted in representative transactions for specified equipment goods, which also included imported products, where typical. The consulting firm provided explicit estimates for important additional costs to purchasers such as installation (where required), transportation (where significant), tariffs, and taxes. Intracompany transfer prices were not collected.

Efforts were made to ensure that the definitions and methodology used in price collection in the United States and in Canada are as close as possible. In the absence of precise international guidelines to the typical users and market characteristics of items to be priced, though, typical Canadian transaction terms were applied.

The resource limitations, however, led to the imposition of some constraints on data collection. For example, reference prices for 1985 were needed, but the study was conducted mainly in the May to August 1986 period. For this reason, prices prevailing at that time were adjusted to the mid-July 1985 level using the closest corresponding Statistics Canada price indexes (some of them unpublished) and the relevant information on tax and tariff changes. Also, average prices from the most active markets in Central Canada (Ontario and Quebec) were assumed to satisfy the requirement for national average prices. This notwithstanding, some items were priced in other regions, where the market for those goods was large.

According to the OECD methodology, which was also used for the U.S.-Canada bilateral comparisons, the pricing of selected construction projects is based on their detailed specification. In the 1985 round, Canada priced 16 construction projects. Eleven of them were the same as those Canada had already priced in the 1980 round of international comparisons, namely, a single-family house (row house), an apartment building, a factory, an office building, a school, a road, a sewer main, an electricity supply project, a concrete bridge, a cattle house, and an agricultural shed. Their specifications had been translated into North American terminology and adjusted to the Canadian construction technique and standards as in the 1980 comparisons.

The five new projects priced by Canada in 1985 were: a detached single-family house, a sports hall, a car park, pavement reconstruction, and a sports facility. They were translated into North American terminology by the consultants hired to do the pricing of construction projects for the United States in 1985.

Because Statistics Canada uses a similar methodology of pricing the construction projects for its regular price index series, a large portion of detailed price data which serve as inputs in those series was also applicable in the international comparison project, both multilateral and bilateral. Nevertheless, about one-third of detailed input price data had to be collected especially for the purpose of international comparisons.

The Canadian prices relate to the Toronto area, which is geographically central and represents a substantial share of Canada's construction activity. In this task, Statistics Canada received assistance from the Ontario Department of Highways, the Ontario Department of Agriculture, the City of Toronto Department of Public Works, and the Hydro of North York (a Toronto suburb).

Close contact was maintained with the consultant doing the U.S. price estimation to enhance the quality of the

bilateral comparison. There was an exchange of ideas about the interpretation of particular projects, as well as an exchange of detailed input price data. This notwithstanding, several questions remain as to the comparability of some prices between the United States and Canada.

Public consumption. Canadian price data were specifically prepared in the following two areas of inputs to the government services: compensation for selected categories of employees in general government and health and educational services; and prices of public utilities (in particular, electricity, natural gas, fuel oil, and water). With respect to public utilities, the parties decided that commercial rates paid by large users would be most appropriate. Consequently, the data were drawn from lists of tariffs provided by regular respondents to Statistics Canada.

With respect to compensation for employees in general government and health services, data were prepared by the Pay Research Bureau, a Federal agency which gathers data on remunerations for various government jobs at the Federal, provincial, and city levels, including health services. The Pay Research Bureau identified in its own surveys those job categories that most closely matched the descriptions adopted by the OECD for the purpose of international comparisons. It provided information on basic salaries as well as other payments and social contributions for the selected categories of employees.

The Canadian average compensation by category of employees (job specification) in general government and health services was calculated by averaging the appropriate data for employees at the three levels of government (Federal, provincial, and municipal), whenever applicable. The average total compensation for a particular category of employees at a given level of government was estimated from the respective average basic salary, augmented using coefficients that represented the proportion of other payments and social contributions to the basic salary. The above coefficients were derived from data relating to employees of all categories at a given level of government. The data on compensation relate to mid-1985 and were not adjusted to the average 1985 level.

With respect to compensation for employees in education services, data on basic salaries were provided by the Education, Culture and Tourism Division of Statistics Canada. For basic salaries, an equi-weighted average of data from two consecutive school years, 1984-85 and 1985-86, was used. Within each designated teachers category, the average basic salary was represented by a salary in the modal class of employees, with classes established according to the number of years of education achieved by teachers (which is a salary-determining variable in most school jurisdictions). Because of lack of specific information on other payments and social contributions by employers, the same coefficients were applied as for the employees in general government and health services at the provincial level (the education system being primarily administered by provinces). □